

Application No.: 10/701,044

### REMARKS/ARGUMENTS

Reconsideration and re-examination are hereby requested.

With regard to the IDS filed 11/04/2004, the IDS statement included therein the following statement:

The attached Form PTO/SB/08A lists two references, one entitled "Power Measurement Basics" and the other entitled "Coplanar Waveguides Supported by InGaP and GaAs/AlGaAs Membrane-Like Bridges." These two references should be considered as prior art known to the Applicants at the time the Applicants made their invention. (emphasis added)

It is again respectfully requested that the two references be considered by the Examiner "as prior art known to the Applicants at the time the Applicants made their invention" and that the PTO/SB/08A be initialed by the Examiner.

The claims stand rejected as being either anticipated by, or obvious in view of Haimson (U. S. Patent No. 4,713,518).

Before discussing the rejection perhaps it might be helpful to review features of Applicant's invention:

It is noted that resistor R1 is connected between nodes A and D. Resistor R2 is connected between nodes A and B. Resistor R3 is connected between nodes D and C. And, Resistor R4 is connected between nodes B and C. Further, the resistors R1 through R4 are thermistors, that is, the resistance thereof is a function of their temperature.

It is noted that the resistors R1 and R4 are shunted by capacitors C<sub>A</sub> and C<sub>B</sub>, respectively, as shown. Further, Node A is coupled to: an RF input voltage 12 through a capacitor C1; a load RL, through a capacitor; and, a dc voltage source 14 through an RF choke 16.

Under a dc bias provided by dc source 14, and in the absence of RF input, the values of resistors R1 and R2 are set to be equal to each other. The values of R3 and R4 are also set to be equal. Accordingly, the nodes D and B are at the same potential, i.e.,

$$V_{out}=V_d-V_b = \frac{(R_3R_2-R_4R_1)}{(R_1+R_3)(R_2+R_4)} V_{dc} \text{ Equation 1}$$

This potential remains at zero even if the temperature of the substrate 20, upon which they are disposed, varies because the temperature coefficients of resistance for the resistors R1 through R4 are equal. Therefore, the ratio of the resistor values of resistors R1 through R4 will stay the same in the absence

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of RF input power.

Upon application of the RF input power, RF current divides equally between the two parallel elements of the bridge 11; equally through the element having resistors R1 and R3 and the element having the resistors R2 and R4. However, resistor R1 and R4 are bypassed (i.e., shunted) with the capacitors C<sub>A</sub> and C<sub>B</sub>, respectively. These resistors R1 and R4 will therefore heat less than resistors R2 and R3 because the resistors R1 and R4 receive additional heating from the RF power passing through such resistors R2 and R3. That is, resistors R2 and R3 become heated by both the dc power and RF power, whereas resistors R1 and R4 become heated from only the dc power. Because R2 and R3 become heated by both the dc power and RF power their resistance will increase greater than any increase in resistance of resistors R1 and R4 which become heated from only the dc power. This will result in a resistance imbalance in the bridge 11; i.e., the voltage between nodes B and D will increase from zero. Assuming a positive temperature coefficient (i.e., the change in the resistance of the resistors R2 and R4 is positive, dR/dT>0), the result will be that the potential at node D will rise toward the positive rail V<sub>dc</sub> and the potential at node B will move toward dc ground potential resulting in (V<sub>d</sub>-V<sub>b</sub>)>0.

Close to balance, the response of the bridge is highly linear and is obtained by differentiating Equation 1 with respect to the resistances. One then evokes the relationships between the resistors needed for bridge balance. The change in output voltage due to change  $\delta R_2$  and  $\delta R_4$  in the resistances is given by

$$\delta V_{out} = \frac{(2 \cdot R_2 \cdot R_3)}{(R_1 + R_3) \cdot (R_2 + R_4)} \left( \frac{\delta R_2}{R_2} - \frac{\delta R_4}{R_4} \right) \quad \text{Equation 2}$$

If similar materials are used for the resistors, it is evident that ambient heating will give no change in the output voltage. On the other hand, any process such as RF heating which effects the resistors differently will result in a change in V<sub>out</sub>. The output is linear with heating and is devoid of a DC output offset which would interfere with subsequent amplification.

### **THE REJECTION**

Applicant respectfully disagrees with two positions taken by the Examiner:

First, Applicant disagrees with the Examiner's position that the bridge 12 of Haimson is described as a Wheatstone bridge, for to the contrary it is described as a hybrid junction, or short branch coupler, hybrid ring etc which can be represented as an eight terminal network;

Second, the bridge 12 of Haimson inherently has four resistors, reference being made

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to the following US Patent Nos. 5,874,867 and 4,316,160 (copies attached) and therefore Applicant respectfully requests that the Examiner support this "inherency" position for the record; and

Third, whereas Applicant is refereeing to elements within the bridge as responding differently to rf energy, the Examiner refers to (Column 8, lines 48-58), and such section of Haimson refers to the accelerator waveguide, which is not part of element 12 and the interconnecting transmission lines (and components) comprising the remainder of the feedback loop, also not part of element 12

More particularly, the Examiner takes the position that element 12 is a Wheatstone bridge. It is first noted that at column 7, line 3, Haimson indicates that element 12 is "an RF bridge network". Reference is made to Haimson column 1, lines 18-42:

Travelling wave linear accelerators have been disclosed in the past wherein feedback of the remnant RF power from the output of the linear accelerator is combined in suitable phase relationship with input power from the RF source using an RF bridge. With proper phase conditions, the RF power entering the accelerator can be increased above that available from the source by a factor which depends upon the total attenuation in the feedback loop and upon the RF bridge ratio. Such systems are disclosed by R. B. R. Shersby-Harvie and L. B. Mullett in "A Travelling Wave Linear Accelerator With R.F. Power Feedback, and An Observation of R.F. Absorption by Gas in Presence of a Magnetic Field," Proceedings of the Physical Society, pages 270-271, Feb. 3, 1949, and P. M. Lapostolle and A. L. Septier, "Linear Accelerators," North-Holland Publishing Company, Amsterdam, pages 56-60 (1970).

The patent then points out that:

A variety of RF bridge circuits, suitable for this feedback application, include coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings, etc., each of which can be represented as an eight terminal network arranged so that the following specific conditions are satisfied. Assuming four transmission lines connected to an RF bridge, as shown in FIG. 1, (a) arms 1 and 3 should be independently matched to the bridge when arms 2 and 4 are terminated by their characteristic impedances; (b) a high degree of isolation should exist between arms 1 and 2 so that power fed into either arm 1 or arm 3 is transmitted to loads in arms 2 and 4 only; (c) conversely, arms 2 and 4

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*should be balanced with respect to each other so that RF power entering either arm is delivered to loads at arms 1 and 3 only; and (d) there should be no power circulating within the bridge.*(emphasis added)

*Thus, there is no description that element 12 is a Wheatstone bridge.*

The Examiner makes the following statements:

1. "Regarding claim 1, Haimson discloses a circuit comprising (figure 4) a Wheatstone bridge (12) having at least one element thereof thermally responsive to radio frequency energy passing therethrough differently from radio frequency energy passing though (sic) at least one other element of the bridge (Column 8, lines 48-58).

Applicant's Comment:

Column 8, lines 48-58 refer to the accelerator waveguide, which is not part of element 12 and the interconnecting transmission lines (and components) comprising the remainder of the feedback loop, also not part of element 12. With Applicant's invention, one element of the Wheatstone bridge, for example the resistor R2 responds differently to radio frequency energy from the way another element of the bridge such as the parallel combination of C<sub>A</sub> and R<sub>1</sub> respond to the radio frequency energy. Applicant respectfully requests the Examiner reconsider statement 1.

2. The Examiner states that "Regarding claims 14 and 15, Haimson discloses a network having (figure 1) four nodes (1-4); and four lumped electrical elements does not explicitly shown (sic) but inherent in any RF bridge."

Applicant's comment:

As Noted above, Haimson states:

*"A variety of RF bridge circuits, suitable for this feedback application, include coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings, etc.,*

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Neither, coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings inherently include " four lumped electrical elements ".

Applicant respectfully requests that the Examine support this statement 2 for the record.

3. "Regarding claims 2, 7, 20, Haimson discloses a circuit comprising (Figure 4) a Wheatstone bridge (12) ...

Applicant's comment:

As Noted above, Haimson states:

"A variety of RF bridge circuits, suitable for this feedback application, include coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings, etc.,

Neither, coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings inherently include " four lumped electrical elements ".

Applicant respectfully requests that he Examine support this statement 3 for the record.

4. "Regarding claims 3, 16, Haimson discloses a first one of the input nodes (11) is coupled to a source of the radio frequency energy (10) and to a source of dc voltage (The source 10 must be connected to DC source to receive power to drive)".

Applicant's comment: Claims 3 and 16 state "wherein a first one of the input nodes is coupled to a source of the radio frequency energy and to a source of dc voltage" (emphasis added)

The Examiner's statements regarding claims 12, 22, 13 and 23 have been

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addressed above,

With regard to the "Examiner's Response to Arguments", applicant does not disagree with the "Google" definitions of Wheatstone bridge, but Haimson does not describe bridge 12 as being a Wheatstone bridge. Further, bridge 12 of Haimson is not inherently a Wheatstone bridge and in fact Haimson does not describe bridge 12 as a Wheatstone bridge but rather describes the bridge 12 as being:

A variety of RF bridge circuits, suitable for this feedback application, include coaxial and waveguide hybrid junctions, short branch couplers, coaxial and waveguide hybrid rings, etc., each of which can be represented as an eight terminal network arranged so that the following specific conditions are satisfied. Assuming four transmission lines connected to an RF bridge, as shown in FIG. 1, (a) arms 1 and 3 should be independently matched to the bridge when arms 2 and 4 are terminated by their characteristic impedances; (b) a high degree of isolation should exist between arms 1 and 2 so that power fed into either arm 1 or arm 3 is transmitted to loads in arms 2 and 4 only; (c) conversely, arms 2 and 4 should be balanced with respect to each other so that RF power entering either arm is delivered to loads at arms 1 and 3 only; and (d) there should be no power circulating within the bridge. (emphasis added)

How does this characterization of the requirements of Haimson's bridge inherently have a network of four resistors?

With regard to Holt US Patent No. 6,486,679, it is first noted that Holt does not call the Wheatstone bridge "an RF bridge" as stated by the Examiner. Rather, Column 1, lines 13-15 of Holt states "FIG. 1 illustrates a bridge configuration that is commonly used in low cost radio frequency (rf) bridge based measuring instruments" (emphasis ours). Thus, Holt does not say the Wheatstone bridge is an RF bridge but rather that a Wheatstone bridge is commonly used as a bridge based measuring instrument.

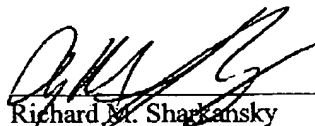
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Thus, in view of the foregoing it is respectfully submitted that the claims 1-13 are not anticipated by, nor obvious in view of Haimson (U. S. Patent No. 4,713,518).

Respectfully submitted,

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